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## PATENT SPECIFICATION

624,303



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### PROVISIONAL SPECIFICATION

#### Improved Retractable Castor Mechanisms.

We, SPENCER, HEATH & GEORGE LIMITED, a British Company, of Gymnastic Engineering Works, Garfield Road, Enfield, Middlesex, and WALTER ERNEST CHAMBERLAIN, a British Subject, of Ingleborough, 54 The Ridgeway, Enfield, Middlesex, do hereby declare the nature of this invention to be as follows:—

The invention has for its object the provision of an improved operating mechanism for retractable castors or similar wheels on heavy article of furniture or other equipment, and it is particularly applicable to gymnasium equipment and theatre stage properties.

15 In retractable castor mechanisms of known construction, the mechanical coupling between the castors and the operating member commonly comprises worm or screw gearing, cams, or some form of toggle linkwork.

20 In the latter cases, the castors are effectively locked in their extended position by the arrangement of the cams or toggle linkwork used, while a similar locking effect is obtained when screw gearing is used because of the irreversible nature of the screw gearing which is employed. Further, apart from its frictional losses, screw gearing also has the disadvantage that it is slow to operate by reason of the high gear reduction ratio between the operating member and the castors, while a self-locking cam or toggle arrangement is inherently somewhat uncertain in operation and liable to allow the supported article to descend to the floor suddenly under the force of its own weight if the article is jarred or the operating member used carelessly.

According to the present invention, retractable castors on articles of the type described are retracted or extended by means of a handwheel or lever operatively associated, through a directly coupled linkage without worm or screw gear incorporated therein, with the retractable members carrying the castors, and means for positively locking the castors in their extended position comprise a spring-pressed ball or bolt engaging with the

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operating member or with some other part of the retracting mechanism.

The nature of the invention may be more readily understood by taking as an example its application to a heavy vaulting box as commonly met with in gymnasiums. At and within each of the four corners of the box is mounted a vertically sliding member, to the lower end of which is secured a castor wheel with its swivelling pivot.

An operating device which may be either a handwheel, hand lever or foot pedal is mounted in a position convenient for the operator. This operating or control device is mechanically coupled to the four sliding members so that the castors may be caused to either protrude downwards below the base of the box, and so raise and support the latter clear of the floor, or conversely the castors can be retracted so that the box descends to rest directly upon the floor.

The operating device is conveniently in the form of a pedal adapted for foot operation, and formed at the end of a cranked axle capable of turning in bearings within the vaulting box. Also pivotally secured to cranks on said axle are thrust rods having their other ends pivoted to bell-crank levers engaging in slots in the sliding members carrying the castors, which are preferably furnished with ball bearings. Rotation of the said axle caused by operation of the pedal is effective to move the thrust rods longitudinally to rotate the bell-crank levers and thereby retract or extend the sliding members. By means of this direct coupling between the operating pedal and the castors, quick and convenient operation is obtained, with negligible frictional resistance, and it is a rapid and simple matter for one person to raise a heavy article on to its castors for moving about the floor.

In order to retain the castors in their extended position, a spring actuated bolt or ball is used, which automatically and positively locks the pedal at the end of its downward travel when the castors are fully extended. This lock is necessary owing to the directly

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coupled linkwork between castors and pedal not being irreversible. Before the castors can be retracted this bolt or ball must be withdrawn by the operator, and the bolt or ball is so shaped that after it has entered its socket it becomes locked or retained therein. The effect of this interlocking is that the bolt or ball cannot be withdrawn unless enough pressure is first applied to the pedal to overcome the weight of the vaulting box. Without the provision of this interlocking construction there is a danger that, on withdrawal of the locking bolt or ball, the box would suddenly descend to the floor, and might trap and injure the foot of the operator, but the arrangement described ensures that the retracting mechanism is fully under control before the locking device can be released.

The pedal can be arranged almost flush with the side of the box and with a minimum amount of projection for operation by the foot, and the locking bolt can be controlled by a push button flush-mounted in the side of the box. There is accordingly nothing in the mechanism which projects and which might catch in the clothing of the user or gymnast.

Operation of the castors is extremely simple. To bring them into use the pedal is simply depressed and it automatically locks. To retract the castors foot pressure is put on the pedal, the push button depressed, and the

box allowed to settle solidly upon the floor.

For convenience and speed of operation all four castors have been described as coupled to a single control member, but where very heavy articles are to be controlled each castor or pair of castors may have its separate operating mechanism.

In the case of vaulting boxes which might possibly be used before the castors have been retracted, rigid connecting members may be replaced by links of an elastic nature adapted to yield, if more than the load due to the normal weight of the box be imposed. By this means damage to the mechanism from overloading is avoided.

Alternatively to avoid overstrain of the mechanism, it may be arranged that the castors are urged to their extended position by spring pressure, and forcibly retracted by the operating control element, and in this case, the desirability of making the withdrawal of the pedal locking bolt contingent upon pressure having been first applied to the pedal becomes less urgent, and the interlocking provision previously referred to may be omitted.

Dated this 1st day of July, 1947.

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## COMPLETE SPECIFICATION

### Improved Retractable Castor Mechanisms.

We, SPENCER, HEATH & GEORGE LIMITED, a British Company, of Gymnastic Engineering Works, Garfield Road, Enfield, Middlesex, and WALTER ERNEST CHAMBERLAIN, a British Subject, of Ingleborough, 54 The Ridgeway, Enfield, Middlesex, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention has for its object the provision of an improved operating mechanism for retractable castors or similar wheels on heavy articles of furniture or other equipment, and it is particularly applicable to gymnasium equipment and theatre stage properties.

In retractable castor mechanisms of known construction, the mechanical coupling between the castors and the operating member commonly comprises worm or screw gearing, cams, or some form of toggle linkwork. In the latter cases, the castors are effectively locked in their extended position by the arrangement of the cams or toggle linkwork used, while a similar locking effect

is obtained when screw gearing is used because of the irreversible nature of the screw gearing which is employed. Further, apart from its frictional losses, screw gearing also has the disadvantage that it is slow to operate by reason of the high gear reduction ratio between the operating member and the castors, while a self-locking cam or toggle arrangement is inherently somewhat uncertain in operation and liable to allow the supported article to descend to the floor suddenly under the force of its own weight if the article is jarred or the operating member used carelessly.

According to the present invention an article of furniture is provided with retractable castor mechanism comprising an axle, a pedal, handwheel or lever for rotatably actuating said axle, cranks on said axle, thrust-rods respectively pivoted to said cranks, a bell-crank lever in respect of each thrust-rod operatively connected thereto by one arm and connected by the other arm to a vertical rod carrying a castor, which rod is slidable between a retracted position and an extended position for use, and means for positively locking the mechanism with the

castors in the extended position.

The nature of the invention may be more readily understood by taking as an example its application to a heavy vaulting box as commonly met with in gymnasiums. At and within each of the four corners of the box is mounted a vertically sliding member, to the lower end of which is secured a castor wheel with its swivelling pivot.

- 10 An operating device, which may be either a foot pedal, a handwheel or a hand lever, is mounted in a position convenient for the operator. This operating or control device is mechanically coupled to the four sliding members so that the castors may be caused to either protrude downwards below the base of the box, and so raise and support the latter clear of the floor, or conversely the castors can be retracted so that the box descends to rest directly upon the floor.

The application of the invention to a vaulting box is hereinafter more fully described with reference to the accompanying drawings, in which Fig. 1 is a perspective view of the vaulting box shown with the castor mechanism in the retracted position; Fig. 2 is a partly sectional side elevation of the lowest portion of the vaulting box, showing the castor mechanism in the extended position; Fig. 3 is a fragmentary view depicting part of the mechanism as seen when retracted, being a section on the line III-III of Fig. 4; and Fig. 4 is a plan of the lowest portion of the vaulting box.

- 35 In said drawings, the numeral 10 denotes the lowest of the nesting portions or frames of the vaulting box seen in its entirety in Fig. 1. Screwed upon the inner face of each longitudinal member of said frame 10 is a pair of brackets 11, disposed one near each corner of the box. Vertically slidable in each such bracket 11 is a rod 12 which is furnished at its foot with a swivelling castor 13 of conventional form.

45 The operating device is conveniently in the form of a pedal 14 adapted for foot operation, and fixed upon the end of an axle 15 capable of turning in bearings 16, 17 within the vaulting box. Also pivotally secured to cranks 18, 19 on said axle 15 are thrust rods 20 having their other ends pivoted to bell-crank levers 21 which engage in slots 22 in the slidable rods 12 carrying the castors. Rotation of the said axle 15 by means of the pedal 14 is effective to move the thrust rods 20 longitudinally to rotate the bell-crank levers 21 and thereby retract or extend the castor rods 12. By means of this direct coupling between the operating pedal 14 and the castors 13, quick and convenient operation is obtained, with negligible frictional resistance, and it is a rapid and simple matter for one person to raise a heavy article on to its castors for moving about the floor.

- 65 Owing to the fact that the directly coupled

linkwork between the castors and the operating pedal 14 is not reversible, it is necessary to provide positive means for retaining the castors in their extended position, in opposition to the downwardly acting force due to the weight of the box. The preferred locking arrangement shown in the drawings for this purpose comprises a pawl lever 22, which is pivoted on the pedal 14, and which is arranged to cooperate with a suitable detent, such as the notch 23 cut in the flange 161 of the bearing 16 at such a position that when the pedal 14 is depressed to extend the castors, the pawl 22 will enter said notch 23 and thereby prevent the retraction of the castors. 80 The notch 23 is preferably arranged tangentially, as shown, in order to prevent the pawl 22 from being inadvertently released, the tangential arrangement necessitating a slight further depression of the pedal 14 to enable the pawl to be withdrawn. Said pawl may have a pedal extension 221 and it is preferably counterweighted as shown at 222.

Operation of the device is extremely simple. To extend the castors the pedal 14 is simply depressed until the pawl 22 engages the notch 23 and the mechanism is then automatically locked. To retract the castors, pressure is put on the pedal 14 with the ball of the foot, the pawl pedal 221 is then pressed, and the box allowed to settle solidly upon the floor.

The pedal can be arranged almost flush with the side of the box and with a minimum amount of projection for operation by the foot, so that there is nothing in the mechanism which projects sufficiently to catch in the clothing of the user or gymnast.

For convenience and speed of operation all four castors have been described as coupled to a single control member but where very heavy articles are to be controlled each castor or pair of castors may have its separate operating mechanism.

In the case of vaulting boxes which might possibly be used before the castors have been retracted, rigid connecting members may be replaced by links of an elastic nature adapted to yield, if more than the load due to the normal weight of the box be imposed. By this means damage to the mechanism from overloading is avoided.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In or for an article of furniture, a retractable castor mechanism comprising an axle, a pedal, handwheel or lever for rotatably actuating said axle, cranks on said axle, thrust-rods respectively pivoted to said cranks, a bell-crank lever in respect of each thrust-rod operatively connected thereto by one arm and connected by the other arm to a vertical rod carrying a castor, said rod be-

ing slidable between a retracted position and an extended position for use, and means for positively locking the mechanism with the castors in the extended position.

5 2. A gymnastic vaulting box, comprising a retractable castor mechanism as claimed in claim 1, wherein the axle is operated by a pedal fixed upon the end of said axle where it projects through the end of the box.

10 3. In or for an article of furniture, a retractable castor mechanism as claimed in claim 1, wherein the locking means comprises a pawl pivotable on the operating member and arranged to engage a detent when the castors are in the extended position.

15 4. In or for an article of furniture, a retractable castor mechanism as claimed in claim 3, wherein the detent is constituted by a notch in a fixed member over which the pawl rides when the operating member is actuated to extend the castors, the arrangement being such that the pawl can only be

disengaged from such notch by a further slight movement of the operating member in the same direction. 25

5. An article of furniture comprising a retractable castor mechanism as claimed in claim 1, and wherein the castors mounted at the several corners are divided into pairs the members of which are connected by separate thrust rods to a double crank fixed on the axle which is operated by the pedal, hand-wheel or lever.

6. The improved retractable castor mechanism according to claim 1, constructed 35 arranged and operating substantially as herein described with reference to the accompanying drawings.

Dated this 28th day of July, 1948.

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W.C.2.

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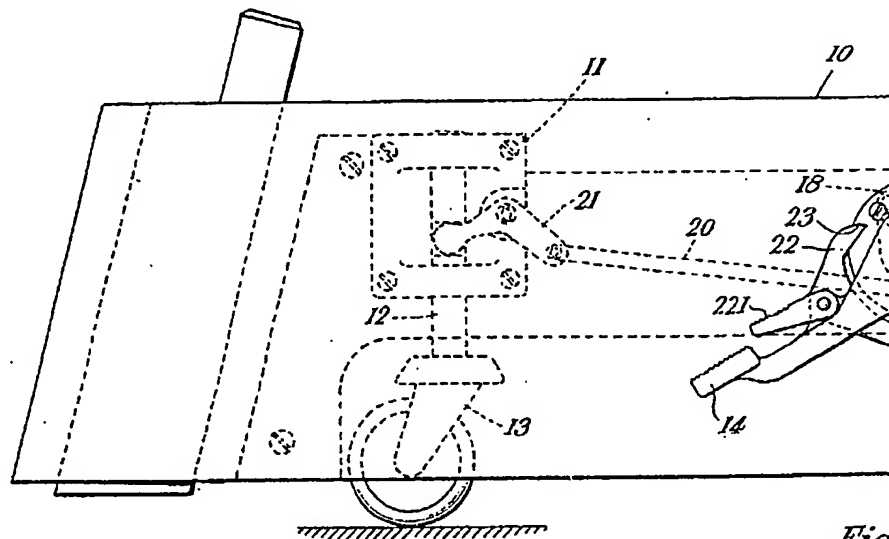


Fig.

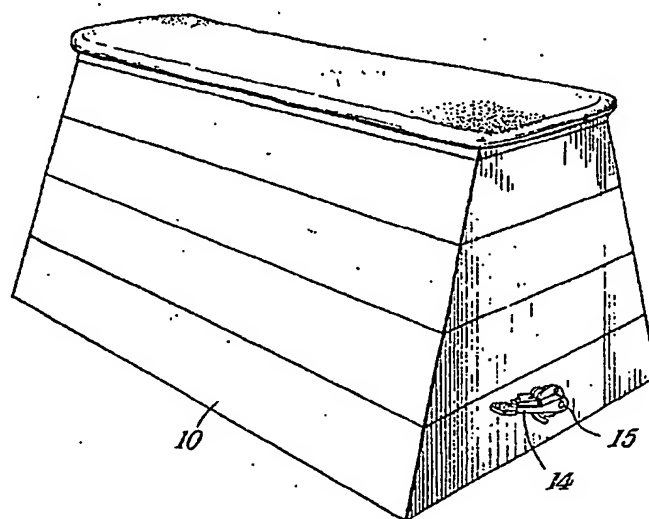
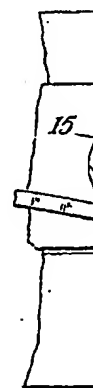


Fig. 1.



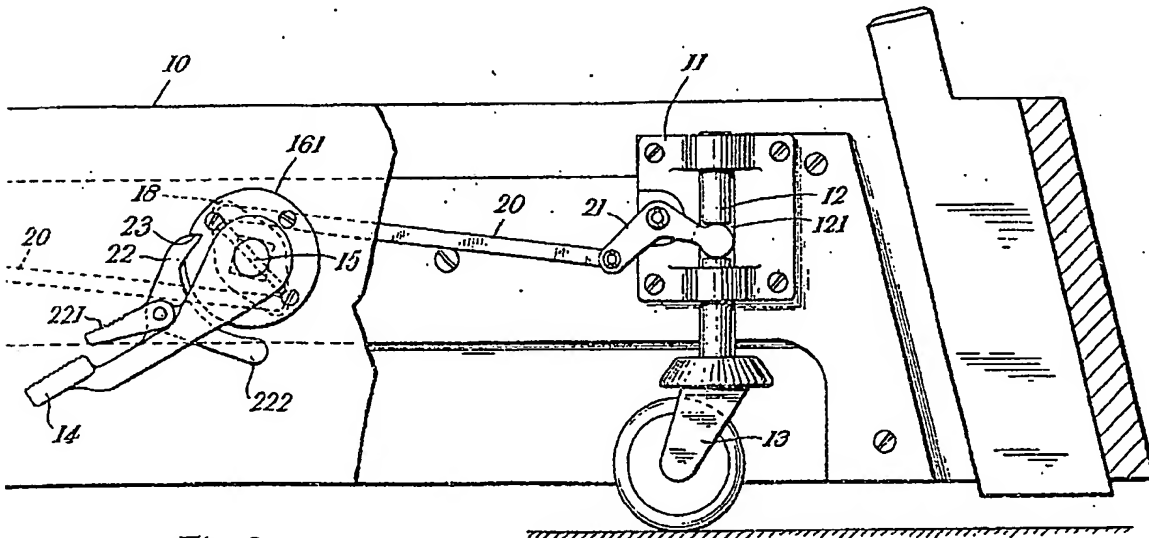


Fig. 2.

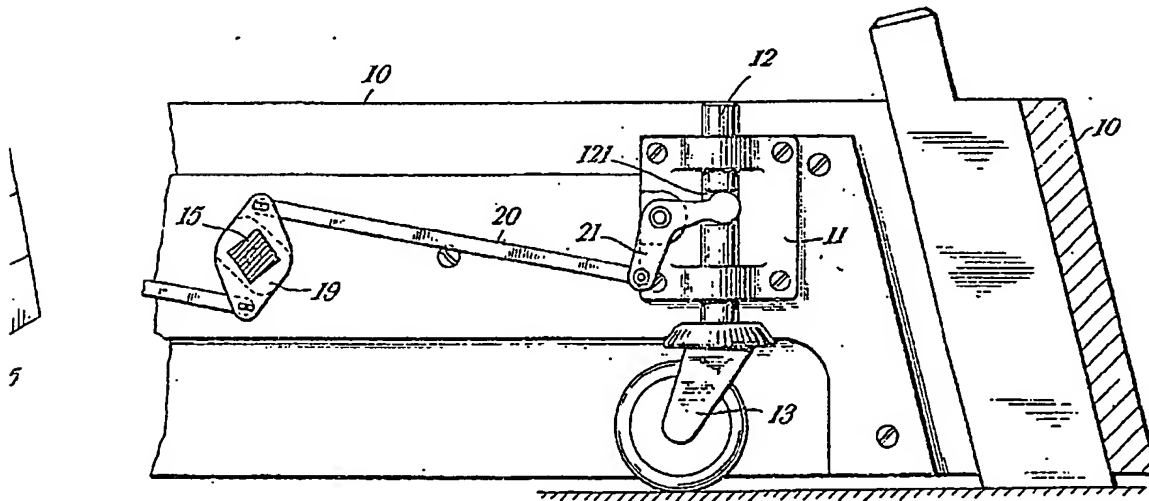
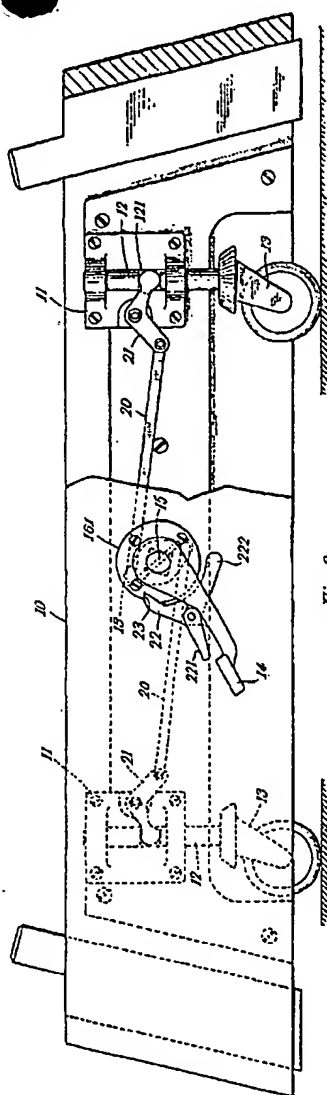
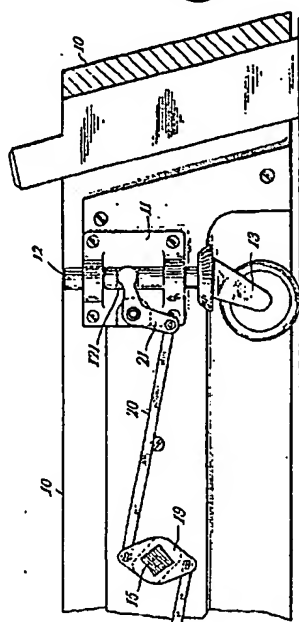


Fig. 3.



Fig. 3.



*Fig. 2.*

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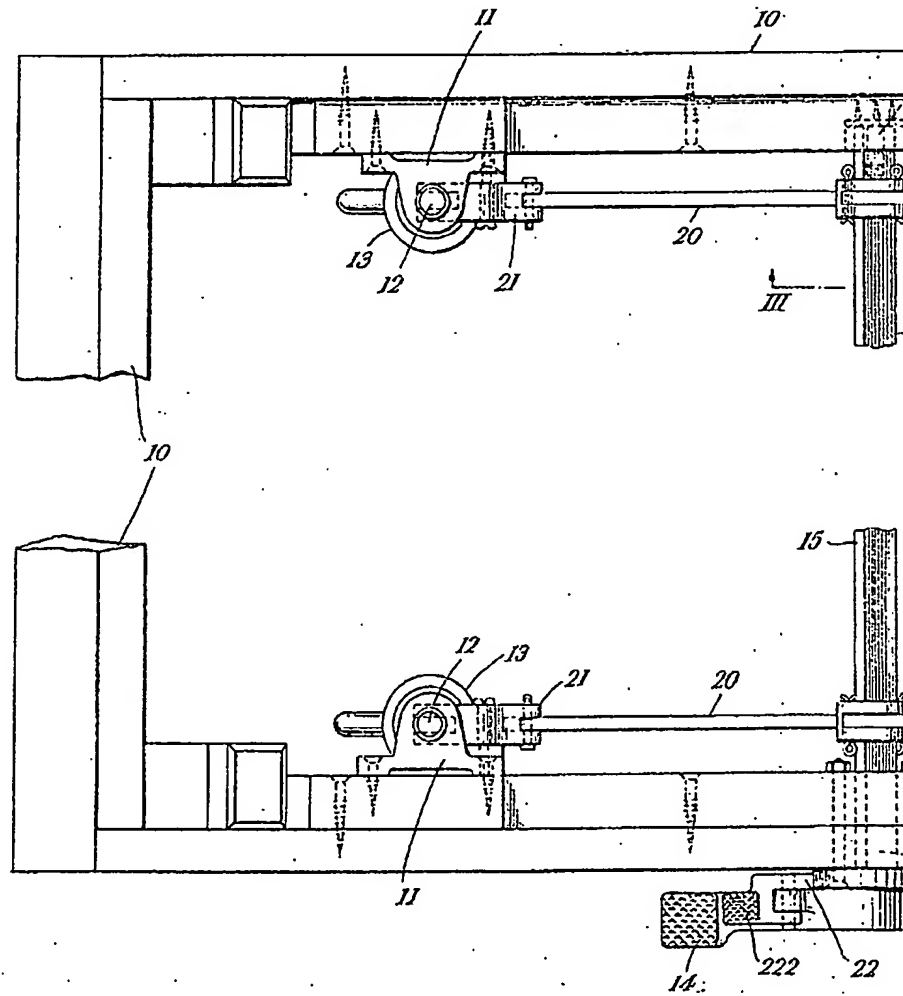
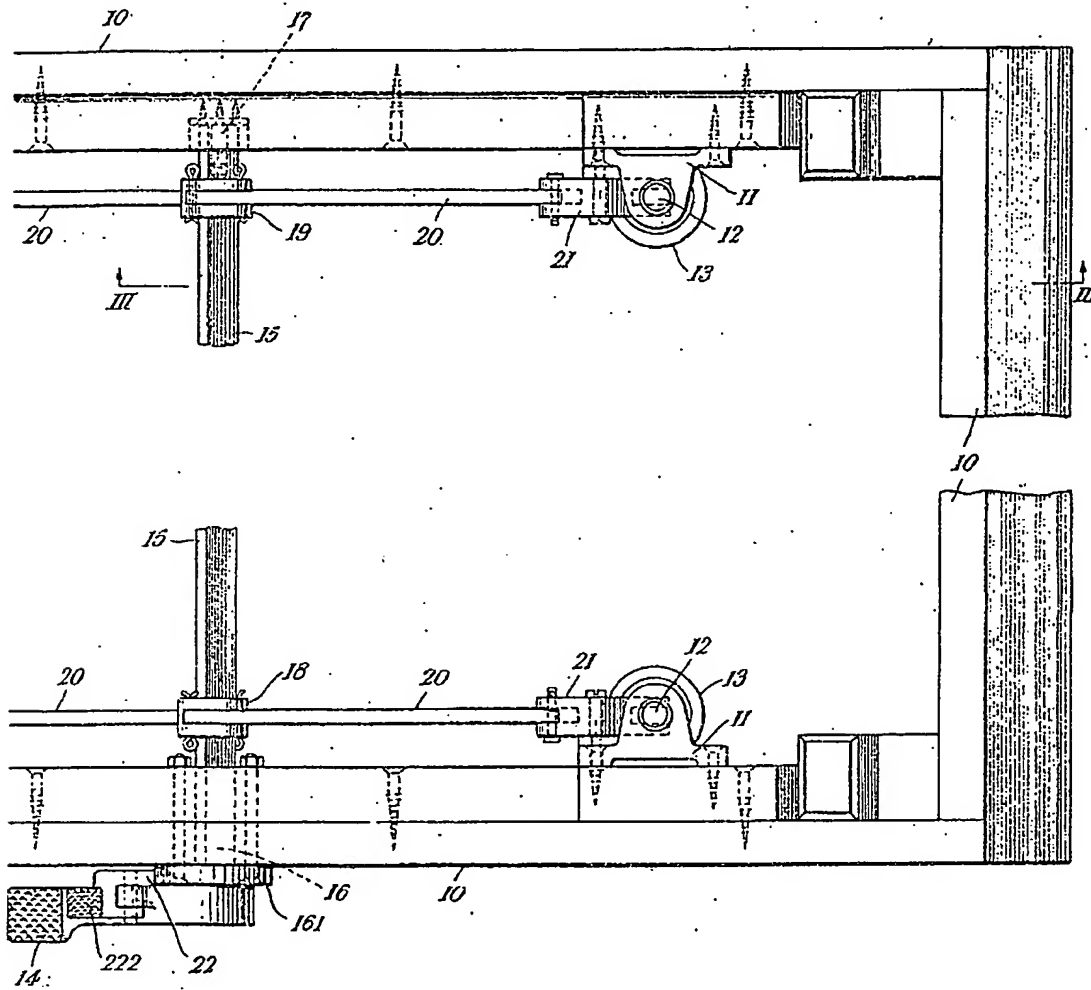


Fig. 1





624,303 COMPLETE SPECIFICATION

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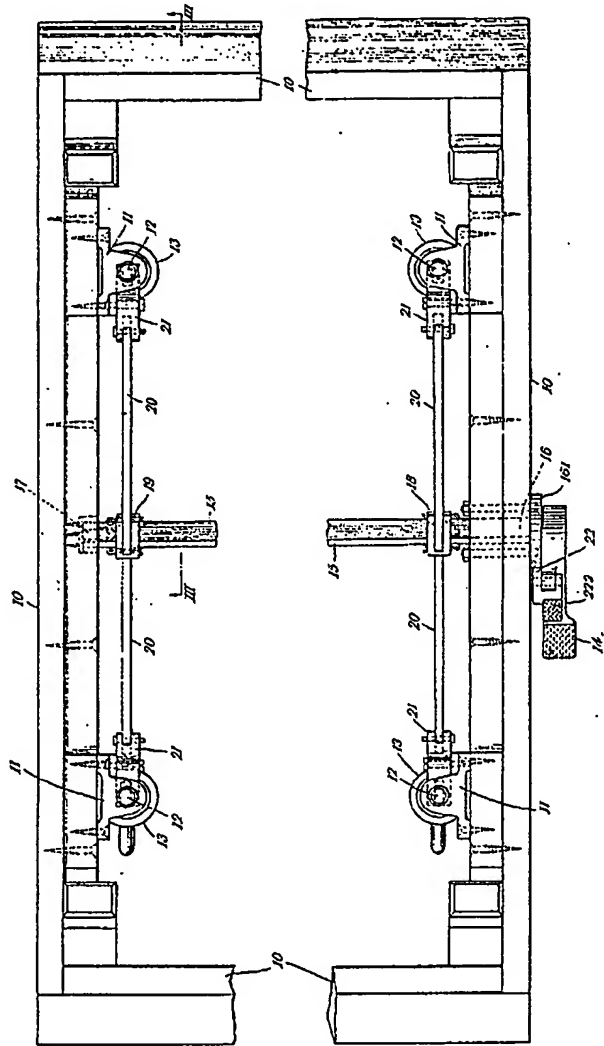


Fig. 4.

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